

REMARKS

Pending in the application are claims 1-73, of which claims 1, 13, 20, 25, 27, 39, 46, 51-52 and 63 are independent. Claims 1-73 are currently rejected by the Examiner. Claim 9 has been amended to address a typographical error. Applicants submit that the amendment introduces no new matter. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance

Claim Rejections under 35 USC § 102

Claims 1-73, of which claims 1, 13, 20, 25, 27, 39, 46, 51-52 and 63 are independent, are presently rejected by the Examiner as being anticipated by Fuduka et al. (US Patent 5,495,417).

For the reasons set forth below, Applicants respectfully traverse these rejections.

Summary of Claimed Invention

Applicants submit that the presently pending claims recite a method, medium and system for forecasting batch end conditions through their depiction as multi-dimensional regions of uncertainty. The present invention provides for the collection of batch process data from an ongoing process such that this data may be analyzed prior to the completion of the batch process. The analysis of this batch process data allow for the determination of an indication of process condition wherein this indication is based in part on predicted future data from the ongoing batch process. A display, such as a computer monitor, may then be used to display the indication of process condition, as well as a control region, in a three dimensional view suitable for evaluation by a user. The display of information may further include the use of volume visualization tools which allow for the viewing and querying of intersecting solids in 3-dimensional space. Furthermore, graphical manipulation of the views of process conditions may be accomplished by changing the hypothetical future values of contributing variables such that a user can simulate the effect of proposed control actions prior to actual changes in the actual manufacturing or software process.

Summary of Fuduka

The cited art reference to Fuduka discloses a system for use in automating the production of semiconductor products by generating a hypothetical process flow definition using a process flow preparation element. This process flow definition may contain any number of processes and process conditions that relate to the production of various types of semiconductor products, in different quantities, in a production line setting. Furthermore, Fuduka discloses the existence of a simulation element for use in evaluating the hypothetical process flow such that the proposed hypothetical process flow is initially simulated in a virtual environment before physical construction of a semiconductor commences. The results of the simulation element are fed back to the process flow preparation element such that the process flow preparation element can optimize the initial hypothetical process flow based on the results of the simulation element. The optimized hypothetical process flow definition is then delivered to a hardware component for use in the physical construction of a semiconductor.

Argument

The Examiner states that claim 1, 13, 20, 25, 27, 39, 46, 51-51 and 63, all of which are independent, are anticipated by the Fuduka reference. Applicants respectfully disagree, on the basis that the Fuduka reference fails to teach each element of the presently pending claims.

In the present application, Applicants respectfully submit that the collection of batch process data, from an ongoing process, is neither recited nor disclosed by the cited prior art reference of Fuduka. The Examiner claims that the Fuduka reference recites the collection of batch process data from an ongoing process as recited in the presently pending application. Applicants respectfully disagree. As noted by the Examiner, Column 15, lines 5-6 of Fuduka disclose the *writing* of a new hypothetical process flow using various components such as a display window, a data selector window, a guide window and an option window. These various windows are all used to *write* the initial process flow such that this new hypothetical process flow may be used in the manufacture of semiconductor components. As noted in Fuduka, the generation of a process flow is managed by a “process flow preparation section”, illustrated in

Figure 1B, which serves to write the initial continuous process flow. As recited in column 5, lines 45-49,

“a process flow preparation system enables an operator to quickly and easily prepare a process flow for producing semiconductor products in a production line, with least knowledge of the production line.”

In contrast, the present invention teaches the *collection of batch* data processes from an *ongoing* process, as opposed to the generation of an initial process flow. As recited at Page 10, lines 31-33 of the present application, “The source of collected process data 15 is collecting, or has collected, data from a process 19 that may be ongoing and may be a continuous process.” The collection of process data is further recited in independent claim 1, for example, which reads in part:

“collecting batch process data from an ongoing process, said collection of process data being measurements of said ongoing process”

Furthermore, the present application is directed to collection of batch processes which may have varying conditions over the course of their run. As these are varying processes, any assessment of the batch condition requires the entire course history to be taken into account and not just the current conditions. The collected batch process data may include n dimensions of scores wherein the scores include common factors chosen by a user to monitor significant components of overall process condition.

In view of such language, Applicants respectfully submit that the Fuduka reference fails to anticipate the collection of batch process data from an ongoing process but rather merely recites the generation of an initial set of process data for use in semiconductor manufacturing.

In regard to the analysis of the collected process data, Applicants further submit that the Fuduka reference fails to anticipate the present invention. Because the “analysis” recited by the Fuduka reference, as detailed at column 9, lines 30-35, is the determination of whether a process flow has an error condition. This analysis is completed on a prior generated process flow which

is not currently ongoing. If an error is found, the error condition is transferred back to the process flow preparation section for generation of a new process flow without the error condition. When a process flow without any errors is analyzed, this process flow is passed to a production section for construction of semiconductor components.

In contrast, the present invention teaches analysis of an *ongoing batch process* prior to the end of the process. This analysis may take numerous forms, including statistical analysis using Principle Component Analysis (PCA), Multi-way PCA, Projection on Latent Structures (PLS), Multi-way PLS or Functional PCA analysis prior to the end of the ongoing process. The result of this analysis, as well as a prediction of future data from the ongoing batch process, is used to determine an indicator of process condition. Predictions of future data from the ongoing process may further include estimates of the uncertainty of the forecasts. The indicator of process condition is then displayed to a user using a variety of available formats. In view of the above, Applicants respectfully submit that the analysis of collected process data prior to the completion of the batch process is not disclosed by the Fuduka reference. Applicants further submit that the Fuduka reference fails to recite the prediction of future data from the ongoing batch process wherein this prediction is used to determine an indicator of process condition. Additionally, Applicants submit that the display of an indicator process condition in accordance with the present invention is not disclosed by the cited reference. As recited in column 15, lines 6-30, various windows may be used to show aspects of the generated process flow of Fuduka. In contrast, the present invention displays an indicator of the process condition relating to an ongoing process based upon collected batch process data.

In light of the above arguments, Applicants submit that the cited Fuduka reference fails to recite each element and limitation of the present application. Applicants further submit that independent claims 1, 13, 20, 25, 27, 39, 46, 51-52 and 63 are in condition for allowance and respectfully request that the Examiner withdraw the rejection to these claims and pass them to allowance.

In regards to dependent claims 2-12, 14-19, 21-24, 26, 28-38, 40-45, 47-50, 53-62, and 63-73, all of which depend on the aforementioned independent claims for support and serve to limit said independent claims, Applicants submit that these dependent claims are not anticipated

by the Fuduka reference and are in condition for allowance by their very nature as dependent claims which rely on independent claims for support. For example, claims 2, 14, 22, 28, 40, 48, 53 and 64 wherein the ongoing process, namely one that has not yet completed, is a mechanical process or a software process. In contrast the "process" of Fuduka is newly generated process flow description that is simulated and then derived to a manufacturing element for use in generating a semiconductor. The process flow description of Fuduka is not an ongoing non-steady state batch process but rather is a description of the steps necessary for the eventual manufacturing of a semiconductor.

Additionally, dependent claims 9,15,23,35,41,49,60 and 71 further recite the limitation of using Principle Component Analysis (PCA), Multi-way PCA, Projection on Latent Structures (PLS), Multi-way PLS or Functional PCA analysis. The use of analysis method such as these are neither recited nor disclosed by the Fuduka reference.


Conclusion

In view of the above, Applicants respectfully submit that each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Applicant believes no fee is due with this statement. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. MWS-092 from which the undersigned is authorized to draw.

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Respectfully submitted,

By 

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